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NEMATODES OF ALFALFA (*MEDICAGO SATIVA* L.)
I. ROOT-KNOT NEMATODES.

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Several plant-parasitic nematodes have been reported as pests of alfalfa. They can cause substantial losses to alfalfa stands, and thus, suppress seed production under certain conditions. Nematodes can adversely affect emergence and establishment of young seedlings and can also play an important role in disease complexes involving other organisms. This circular will discuss the role of root-knot nematodes as serious pests of alfalfa.

Five species of root-knot nematodes have been identified as alfalfa pests. They are ***Meloidogyne hapla*** Chitwood, 1949, the northern root-knot nematode; ***M. chitwoodi*** Golden et al., 1980, the Columbia root-knot nematode (race 2); ***M. incognita*** (Kofoid & White, 1919) Chitwood, 1949, the southern root-knot nematode; ***M. javanica*** (Treub, 1885) Chitwood, 1949, the Javanese root-knot nematode; and ***M. arenaria*** (Neal 1889) Chitwood, 1949, the peanut root-knot nematode.

Although found in many soil types, root-knot nematodes thrive best in sandy loam soils. Small, smooth, oval galls develop and sometimes excessive branching occurs on infected alfalfa roots at the site where root-knot nematodes have fed (Fig. 1). These nematode initiated galls sometimes resemble nitrogen fixing nodules but can be readily distinguished since bacterial nodules grow out from the root surface, are rugose and do not cause the root to swell (Fig. 2). Severe stand and vigor reduction can result from heavy infestations, especially in newly planted stands. Generally, once a stand has become established root-knot nematode damage is less severe; however, root-knot nematode infections cause physiological changes in plants resulting in easier entry and increased susceptibility to other alfalfa pathogens, leading to increases in incidence and severity of alfalfa diseases.

Disease Cycle

The adult root-knot nematode female feeds inside the root, but deposits her eggs on the surface of the alfalfa root. When temperature and soil moisture are favorable, the eggs hatch and the newly hatched second-stage juveniles migrate into the soil or to nearby plant roots. They invade the plant near the root tip and feed with their head and bodies permanently buried in the plant tissue. Their feeding results in a disruption of the vascular cylinder and interferes with cellular differentiation. Root-knot nematode feeding induces the formation of specialized cells called giant cells that enlarge and become a continual food source for the nematode. They also increase root cell division forming root swellings. The nematode derives its common name from this root swelling or galling which resembles knots on the roots. Juvenile females feeding in these giant cells rapidly increase in size and become pear-shaped as they near maturity. Mature females may deposit from 400-800 eggs in a protective gelatinous matrix which adheres to the outer surface of the root.

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Management Considerations

Root-knot nematodes with their extensive host ranges may cause an economic problem on susceptible crops that are grown in rotation with alfalfa. Thus, where crop rotations are being considered, it is imperative to know which root-knot nematode species may be present in order to plant nonhost crops. However, it should be remembered that many fields have mixed root-knot nematode populations. Resistant alfalfa varieties are the most practical method of combatting root-knot nematodes because chemical control is not economically feasible. A limited number of resistant varieties are available, but they are adapted to certain climatic areas. Two germplasm sources, Nevada Syn XX and Nevada Syn YY, have resistance to ***M. hapla***, while the African alfalfa cultivars are resistant to ***M. incognita*** and ***M. javanica*** (Fig. 3).

REFERENCE:

Griffin, G. D. 1984. Nematode parasites of alfalfa, cereals and grasses. In Plant and Insect Nematodes (W. R. Nickle, ed.). Marcel Dekker, Inc., NY. Pp. 243-321.

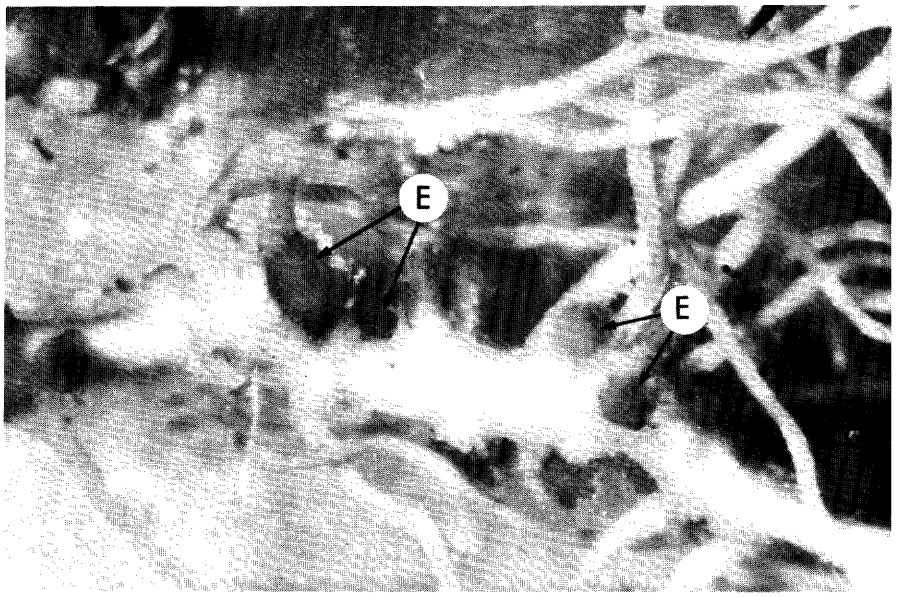

Fig. 1. Alfalfa roots showing swellings and excessive lateral root proliferation from root-knot nematode invasion. Note dark stained nematode egg masses on root galls (E). (Courtesy R. N. Inserra).

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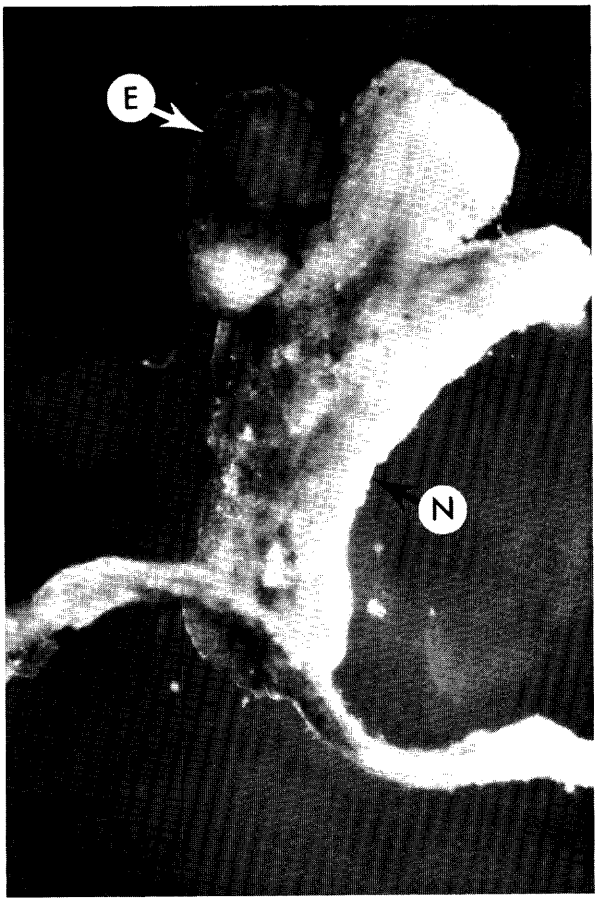

Fig. 2. A nitrogen fixing bacterial nodule growing from an alfalfa root (N). Note dark stained nematode egg mass (E) on side of nodule. (Courtesy R. N. Inserra).

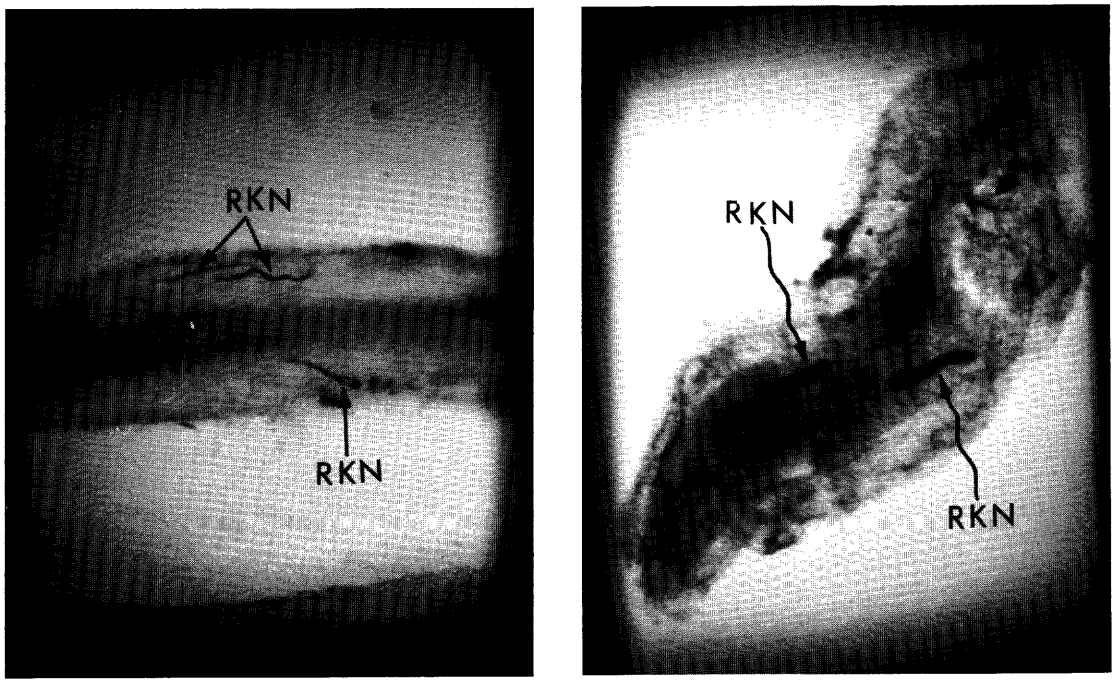

Fig. 3. Penetration of root-knot nematodes (RKN) into roots of a resistant (left) and a susceptible (right) alfalfa cultivars after 7 days. Note lack of development of nematodes in resistant cultivar compared to those in a susceptible cultivar.